In the region of gland implantation the epidermal cells of the calyx and also those of the mesophyll exhibit some modifications. These cells are much smaller than the others, with thin walls, dense cellular contents, and a well defined nucleus. The parenchymatous elements of the thin walled mesophyll are arranged in 3 or 4 layers, like palisade cells. Here, the vascular bundles consist essentially of sieve-tube elements that separate concentrated sugar solutions. Upon submitting the sections to Fehling's solution, the formation of abundant cupric oxide precipitate was observed, indicating the presence of sugars, not only in the cells of the glands, but also in the palisade cells of the mesophyll.

Due to their morphology and reaction of Fehling's solution (indicative of sugar presence), I conclude that the patelliform glands of the calyx of *Adenocalymma comosum* (Cham.) A.P. DC. carry out the function of nectaries.

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GIBSONIOTHAMNUS (SCROPHULARIACEAE) IN PANAMA

The species of the recently described genus *Gibsoniothamnus* L. Wms. (Fieldiana, Bot. 32: 211. 1970) are rarely collected and apparently highly endemic. Besides the three Panamanian species described here and *G. epiphyticus* (Standl.) L. Wms. of Costa Rica, the genus contains three species—*G. cornutus* (Donn. Sm.) A. Gentry, *G. mimicus* (Standl. & Steyerm.) L. Wms., and *G. moldenkeanus* (Standl.) L. Wms.—of Guatemala and adjacent Mexico.

The familial placement of this genus and its ally *Schlegelia* remains a matter of some conjecture as noted by Monachino (Phytologia 3: 102–105. 1949), Williams (Fieldiana, Bot. 32: 211. 1970) and Gentry (Fieldiana, Bot. 34: 55. 1971), among others. The four previously known species of *Gibsoniothamnus* were all described under *Clerodendron* in the Verbenaceae. One of these same species had also been described under *Schlegelia* of the Bignoniaceae. *Schlegelia* itself was described twice, first in Gesneriaceae (later transferred to Bignoniaceae) and again in Scrophulariaceae as *Dermatocalyx*; *Schlegelia* and *Dermatocalyx* were treated separately in such works as Bentham & Hooker's *Genera Plantarum* (1876), Baillon's *Histoire des Plantes* (1888, 1891), Engler and Prantl's *Natürlichen Pflanzenfamilien* (1894), and Standley's *Flora of Costa Rica* (Publ. Field Mus. Nat. Hist., Bot. Ser. 18: 1105, 1128. 1938).

Williams described *Gibsoniothamnus* in the Scrophulariaceae, pointing out that it has even more in common with that family than does *Schlegelia* and interpreted the new genus as evidence linking *Schlegelia* with Scrophulariaceae

rather than Bignoniaceae. On the basis of a study of its placentation, Leinfellner (Oesterr. Bot. Zeit. 121: 13–22. 1973) likewise interprets *Schlegelia* itself as agreeing better with Scrophulariaceae than with Bignoniaceae. The ovary of *Gibsoniothamnus* is completely bilocular with a single central placenta in each locule and clearly fits Scrophulariaceae better than Bignoniaceae. Its small angulate seeds lack foliaceous cotyledons and are completely unlike the seeds of Bignoniaceae but quite acceptable for Scrophulariaceae. On the other hand the woody habit, opposite leaves and close relationship to *Schlegelia* which has been traditionally treated as Bignoniaceae suggest that family. The calyces of several species of *Gibsoniothamnus* closely resemble those of *Capsicum chacoense* Hunz. and its allies and have led to confusion with Solanaceae, as has a superficial similarity to some species of *Witheringia*. *Gibsoniothamnus* also resembles some species of *Lisianthus* (Gentianaceae) to some extent. As an indication of the problems involved, it might be noted that specimens of *G. latidentatus* in the Missouri Botanical Garden herbarium have been referred to at least the five different families mentioned above (Verbenaceae, Scrophulariaceae, Bignoniaceae, Gentianaceae, and Solanaceae) during routine curatorial work, surely some kind of a record in taxonomic confusion.

The Panamanian collections of *Gibsoniothamnus* belong to the following three new species.

1. **Gibsoniothamnus allenii** A. Gentry, sp. nov.

Frutex epiphyticus. *Ramuli* acute tetragoni, glabri. *Folia* elliptica, acuta, late cuneata, subcoriacea vel coriacea, plerumque glabra, integra, margine revoluto, venis secundariis super impressis, infra acute elevatis, domatiis axillaribus ciliatis. *Flores* in bracteatis fasciculis dispositi, bracteis subulatis plus minusve glabris. *Calyx* cupulatus, 5-dentatus, plerumque glaber, dentibus subulatilinearibus 4–6 mm longis. *Corolla* tubulosa, extus glabra, intus lepidota, lobis sparsim ciliatis. *Stamina* quatuor. *Pistilum* 1.6 cm longum, ovario sphaerico, placentatione axili. *Fructus* baccatus, sphaericus, calyce expanso ⅔ obtectus, seminibus numerosis, parvis.

Epiphytic *shrub* 1–2 mm tall. *Branchlets* acutely tetragonal, the angles slightly winged, glabrous. *Leaves* elliptic, 2–8 cm long and 1–3 cm wide, acute, the base broadly cuneate, coriaceous or subcoriaceous, mostly glabrous, sometimes with a few trichomes on median nerve below, with well-developed ciliate axillary domatia below, gland-dotted below, especially toward base, the margins entire, more or less revolute, drying dark above, olive below, secondary veins 1–3 on each side, impressed above, usually raised below, the basal pair ascending more strongly, tertiary veins not evident; petiole 4–10 mm long, glabrous or rarely with a few trichomes. *Inflorescence* a bracteate fascicle, the bracts subulate, 3–8 mm long, mostly glabrous or inconspicuously lepidote, often with a few trichomes mostly along edges or at tip, pedicels to 1.7 cm long at anthesis, to 3 cm long in fruit, glabrous or very slightly lepidote toward apex. *Calyx* cupular, 5-setate, glabrous or with a few scattered trichomes or lepidote scales, 3–4 mm long (not including teeth) and 3–4 mm wide, the setae linear, 4–6 mm long. *Corolla* magenta, tubular, 1.7–1.9 cm long and 2–3 mm wide, the 5 lobes rounded, ca. 2 mm long; glabrous without, sparsely ciliate on lobes, stalked lepidote within on lobes and upper part of tube, pubescent at level of stamen insertion. *Stamens*

4, ca. 1.3 cm long, the staminode 2–3 mm long; insertion 4–5 mm from base of corolla tube. *Pistil* 1.6 cm long, style 1.5 cm long, stigma capitate, ovary depressed globose, 1 mm long, 1.5 mm in diameter, bilocular, the ovules 4–7 seriate on a single central placenta in each locule. *Fruit* a spherical berry to at least 5 mm in diameter, the lower ⅔ covered by the expanded calyx which reaches (without teeth) 4 mm by 8 mm in fruit, the seeds numerous, small, angulate.

PANAMA. COCLÉ: Top of Cerro Pilon, flowers magenta, 13 Apr. 1971 (fl, frt), *Gentry 758* (MO, holotype).

This species is only known from the premontane rain forest like zone above El Valle, Panama.

PANAMA. COCLÉ: Vicinity of El Valle de Antón: epiphytic shrub, flowers rose, N rim (wet), 21 May 1939 (fl), *Allen 1824* (MO). Vicinity of La Mesa, 1000 m, epiphytic shrub, much branched, the branches 2 m long, stems square, flowers pinkish lavender, 12 Apr. 1941 (fl, frt), *Allen 2385* (MO). El Valle de Antón, epiphytic shrub, 2 m, flowers dark purple, 1000 m, 16 Mar. 1946 (fls), *Allen 3414* (MO).

This species was included with *G. epiphyticus* of Costa Rica by Standley (Publ. Field Mus. Nat. Hist., Bot. Ser. 22: 168. 1940) under his *Clerodendron epiphyticum* on the basis of a fragmentary Panamanian collection (*Allen 1824*), bearing a single partially destroyed calyx. Additional material shows that the plant of central Panama differs from that of central and northern Costa Rica in such important characters as glabrous (rather than pubescent) young branchlets, pedicels, calyces, and leaves, and strongly tetragonal (rather than subterete) stems with the raised margins more or less winged.

2. **Gibsoniothamnus pterocalyx** A. Gentry, sp. nov.

Frutex epiphyticus vel scandens. *Ramuli* plus minusve teretes, glabri. *Folia* elliptica, acuta, cuneata, chartacea vel subcoriacea, glabra, integra, margine plano, venis secundariis leviter elevatis super et infra, interdum domatiis axillaribus. *Flores* axillares, singulares vel gemini, pedicellis glabris. *Calyx* (in fructu juveni) cupulatus, 5-dentatus, glaber, dentibus subulati-linearibus, 5–6 mm longis atque alis in calyce extensis. *Corolla*, *stamina*, et *pistillum* ignota. *Fructus* juvenis baccatus, subglobosus, basi calyce expanso tectus.

Woody *epiphyte* or liana. *Branchlets* irregularly terete to subangulate, glabrous. *Leaves* elliptic, acute, cuneate at base, chartaceous to subcoriaceous, glabrous above and below, sometimes with ciliate domatia in axils of lower secondary nerves, gland-dotted below, the margin entire, very slightly or not at all revolute, drying dark olive above, light olive below, secondary veins 2–3 on each side, very inconspicuously raised above and below, the basal pair not noticeably more strongly ascending, tertiary veins not evident; petiole ca. 5 mm long, glabrous. *Inflorescences* of 1–2 axillary flowers, the pedicels glabrous, 2–2.5 cm long (in young fruit). *Calyx* (in young fruit) cupular, 5-setate, glabrous or very slightly lepidote, 2 mm long (not including teeth) and 3 mm wide, the teeth linear, laterally compressed, 5–6 mm long, extending down the calyx as 5 conspicuous lateral wings. *Corolla*, *stamens*, and *pistil* unknown. Young *fruit* a subglobose berry, 3 mm in diameter, its base covered by the patelliformly expanded calyx.

PANAMA. CHIRIQUÍ: Woody epiphyte or liana, calyx greenish white, fruits

green; denuded premontane rain forest between Pinola and Quebrada Seco on Chiriquicito-Calder Trail, 21 Apr. 1968, *Kirkbride & Duke 1020* (MO, holotype).

Known only from the rather unsatisfactory type collection, this species is nevertheless well demarcated by its winged, glabrous calyces, laterally compressed calyx teeth, relatively thin leaves with the secondary veins not impressed above or conspicuously raised below, and more or less terete branchlets. Its one or two flowered inflorescences, if constant, are another conspicuous distinguishing characteristic.

3. **Gibsoniothamnus latidentatus** A. Gentry, sp. nov.

Frutex vel arbor parva, saepe epiphyticus. *Ramuli* acute tetragoni, plus minusve glabri. *Folia* elliptica, acuta, late cuneata, coriacea, plerumque glabra, integra, margine revoluto, venis secundariis super impressis, infra acute elevatis. *Flores* in bracteatis fasciculis vel paniculis valde contractis dispositi, bracteis subulatis strigosis, pedicellis glabris. *Calyx* cupulatus, 5-dentatus, plus minusve glaber, dentibus anguste triangularibus, acutis, 2–4 mm longis. *Corolla* tubulosa, 2.2–3.2 cm longa, extus glabra, intus lepidota, lobis ciliatis. *Stamina* quatuor. *Pistilum* 2.6 cm longum, ovario sphaerico, placentatione axili. *Fructus* baccatus, sphaericus, calyxe expanso inclusus, seminibus numerosis, parvis.

Shrub or small tree to 5 m, sometimes climbing, often epiphytic. *Branchlets* acutely tetragonal, the angles slightly winged, glabrous or with a few appressed simple trichomes at uppermost nodes. *Leaves* elliptic, 4–10 cm long and 2–4.5 cm wide, acute, the base broadly cuneate, coriaceous, glabrous above, mostly glabrous below, sometimes with a few trichomes along main veins and in axils of lateral nerves, without domatia, gland-dotted below, especially toward base, the margin entire, revolute, drying dark above, olive below, secondary veins 2–3 on each side, impressed above, sharply raised below, the basal pair ascending most strongly, tertiary veins not evident; petiole 5–13 mm long, sparsely strigose or glabrate. *Inflorescence* a bracteate fascicle or strongly contracted panicle, the bracts subulate, 1–2 mm long, sparsely strigose, peduncles 0–5 mm long, pedicels elongating to 2.5 cm at anthesis and 4 cm in fruit, glabrous, or slightly lepidote. *Calyx* cupular, 5-dentate, glabrous or very sparsely lepidote or strigose, 12–16 mm long (including teeth) and 5–6 mm wide, the teeth narrowly triangular, acute, 2–4 mm long. *Corolla* magenta, tubular, 2.5–3.2 cm long and 3–4 mm wide, the 5 lobes rounded, ca. 2 mm long, glabrous without, the lobes ciliate, stalked lepidote within on lobes and upper part of tube. *Stamens* 4, anthers very slightly divergent, the thecae 1–1.5 mm long and almost 1 mm wide, the filaments 1.8–2.0 cm long, the staminode 4–5 mm long; insertion 6–7 mm from base of corolla tube. *Pistil* ca. 2.6 cm long, style 2.4–2.5 cm long, stigma subcapitate, ovary globose, 1.5–2 mm in diameter, glabrous, bilocular, the ovules 5–8 seriate on a single central placenta in each locule. *Fruit* a spherical fleshy berry to at least 7 mm diameter, completely enclosed by the expanded calyx which reaches 18 mm by 10 mm in fruit; seeds numerous (ca. 30), small, angulate.

PANAMA. PANAMÁ: Cerro Jefe to Altos de Pacora; shrub along road near Cerro Jefe; flowers tubular, magenta, 15 Apr. 1971 (fl) *Gentry* 759 (MO, holotype).

This species has been collected only near the summit of Cerro Jefe in the premontane rain forest life zone.

PANAMA. PANAMÁ: Cerro Jefe, summit, 2900 ft., epiphyte, shrub to 4 ft., flowers fuschia-colored, waxy, 12 Mar. 1967 (fl), *Dwyer et al. 7293* (MO); forest edge and road bank, shrub 15 ft., perianth china purple, berry green, 29 Jul. 1967 (frt), *Dwyer & Gauger 7351* (MO); shrub 1.5 m, pedicels and calyces red-violet, 23 Jun. 1972 (frt), *Croat 17343* (MO); vine, 19 Jul. 1967 (frt), *Kirkbride & Crebbs 27* (MO).

Gibsoniothamnus latidentatus is easily recognized by its triangular (not linear-subulate) calyx teeth. It is probably most closely related to *G. allenii* which likewise has winged-tetragonal branchlets, but it differs from that species in lacking axillary domatia, in a usually less congested inflorescence, in longer pedicels, and in the usually larger calyx which completely covers the fruit as well as in its triangular calyx teeth.

One additional specimen which is probably referable to *Gibsoniothamnus* remains unidentified. This is *Duke 15657*, from Cerro Pirre, Darién Province. It includes only a twig, unattached leaves and part of a single fruit. The leaf texture is relatively thin and the stems are not tetragonal, indicating possible relationship with *G. pterocalyx*.

The Costa Rican and Panamanian species of *Gibsoniothamnus* can be readily separated by the following key.

1. Branchlets more or less terete or subangulate.
   2. Calyx pilosulus, the teeth compressed parallel to the calyx, sometimes continued as lines on calyx, inflorescence a fascicle of several flowers; secondary veins impressed above, conspicuously raised below; Costa Rica ..... *G. epiphyticus*
   2. Calyx glabrous, the teeth laterally compressed, continued as wings on calyx; inflorescence of 1 or 2 flowers; secondary veins slightly or not at all raised above and below; Panama ..... *G. pterocalyx*
1. Branchlets sharply tetragonal with the angles conspicuously raised.
   3. Calyx teeth linear-subulate; pedicels to 1.7 cm at anthesis and 3 cm in fruit; leaves with axillary domatia; calyx covering lower two thirds of fruit, to 4 mm long (not including teeth) in fruit ..... *G. allenii*
   3. Calyx teeth triangular; pedicels to 2.5 cm at anthesis and 4 cm in fruit; leaves without domatia; calyx completely covering fruit, 10–15 mm long (not including teeth) in fruit ..... *G. latidentatus*

—Alwyn H. Gentry, Missouri Botanical Garden.